



# **Armed Forces College of Medicine AFCM**



## **Case study**

# **Medical Microbiology & Immunology department**



**Male patient 32 years old with irrelevant past history presented to ER complaining of **respiratory distress**. The patient informs the physician that he suffered from rapid onset 6 days duration of parathesia then **weakness in both upper limbs and lower limbs**. Upon examination the ER physician found that the patient blood pressure is 90/50, temp. 37c, blood sugar 110. The physician ask about any symptoms of upper respiratory tract infection, gastroenteritis or vaccination in the last 3 weeks**



The motor examination shows **hypotonia**, **hyporeflexia**, proximal and distal **weakness**. There is no atrophy, hypertrophy nor fasciculations. The patient has **positive radicular stretch**. He loses both superficial and deep **sensation** (radicular distribution). The provisional diagnosis is GBS.

**The plan of management is:**

- Admission to ICU.
- Full lab.
- Lumber puncture.



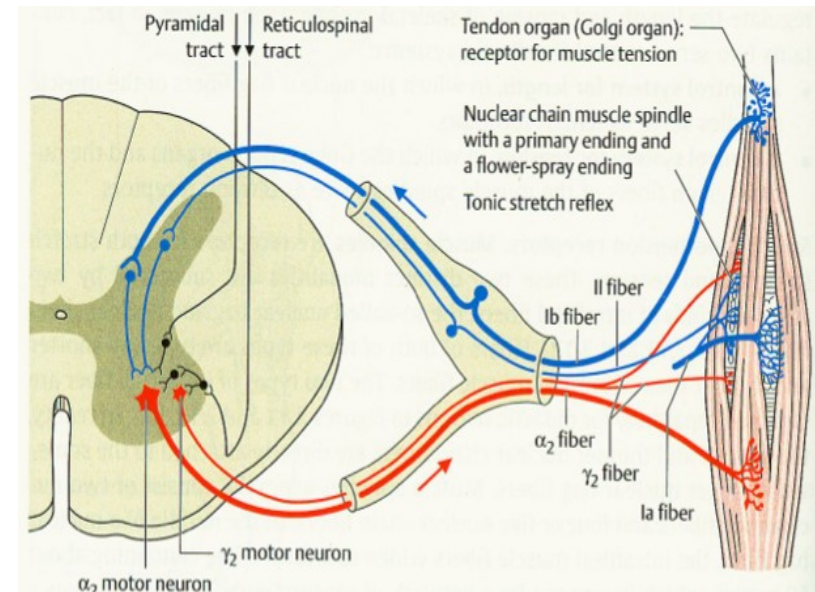
## ?What are the gradings of weakness

### *Scoring muscle strength*

- 0 = No movement
- 1 = Flicker movement
- 2 = Movement when gravity is eliminated
- 3 = Movement against gravity but not against examiner resistance
- 4 = Movement against resistance but weaker than normal
- 5 = Full movement against full resistance

## What are the interpretation of reduced tone?

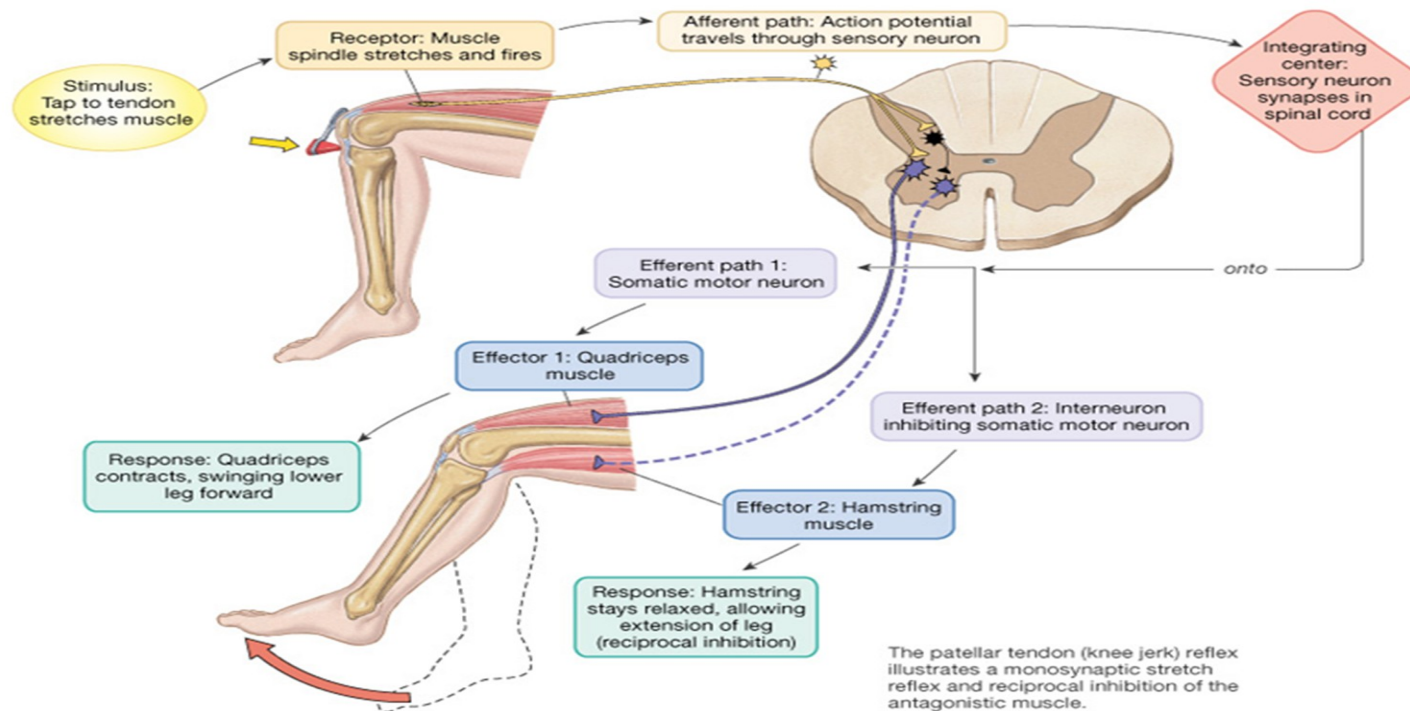
- The muscle tone is a static stretch reflex
  - Stimulus: maintained muscle stretch
  - Receptors: nuclear chain intrafusal fibers
  - Afferent: type II fibers
  - Center: alpha motor neuron
  - Efferent: A alpha motor neurons
  - Response: tonic mild muscle contraction
- 
- Any disease that affect Lower motor neuron (the efferent) leads to reduction in the muscle tone



.Knee and ankle reflex jerks are absent

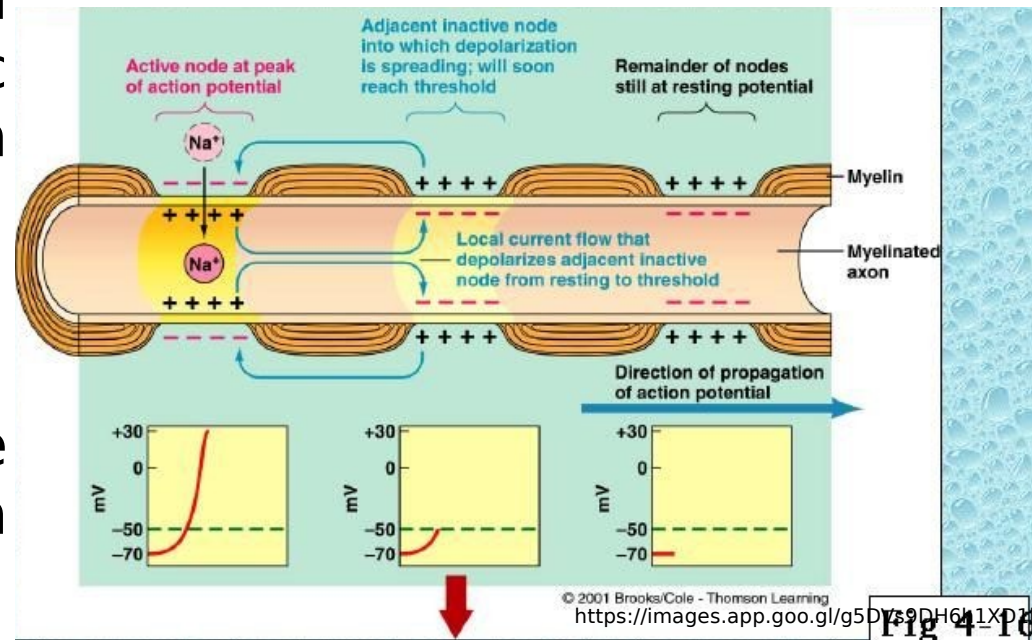
## What are the interpretation of absent jerks?

- Dynamic stretch reflex



## What is the pathophysiological change that resulted in this condition?

- Presence of myelin sheath allows fast and economic nerve impulses conduction by saltatory conduction
- Myelin sheath damage affect nerve conduction velocity





**Is it upper or lower neuron lesion?**  
**Justify your answer**



- This is a lower motor neuron case.
- Localized upper and lower limb weakness.
- Presence of hypotonia and hyporeflexia.



**Patient feet is painful although there is impaired pinprick sensation up to the thighs and reduced joint position sense and vibration sense in the ankles.**

**Explain**



- Pinprick is a fast pain sensation carried by A delta fibers which are myelinated nerves
- Also vibration sense is carried by A beta thick myelinated nerves
- The inflammatory condition will be associated with slow pain, that is carried through slow c un-myelinated fibers



**Interpret the symptoms and signs of patient based on the myelin function**



- This is a Demyelinating disease leading to
- Sensory deficits: lesion in dorsal root myelinated fibers (A delta, A beta) leads to loss of fast pain sensation, vibration sense
- Motor deficits: lesion in A alpha fibers
- voluntary movement: weakness in muscle power
- Stretch reflex: absent; hypotonia, hyporeflexia



**what is the clinical presentation of  
?GBS**



- **Rapid onset,**
- **Regressive course,**
- **Ascending quadriplegia,**
- **Loss of superficial and deep sensation,**
- **Cranial nerve affection (3<sup>rd</sup>, 6<sup>th</sup>, 7<sup>th</sup>, 9<sup>th</sup> and 10<sup>th</sup>),**
- **Radicular pain.**



**?What is the work up for diagnosis of GBS**



**Detailed history and clinical examination, SCF sampling and analysis, nerve conduction study and electromyography.**

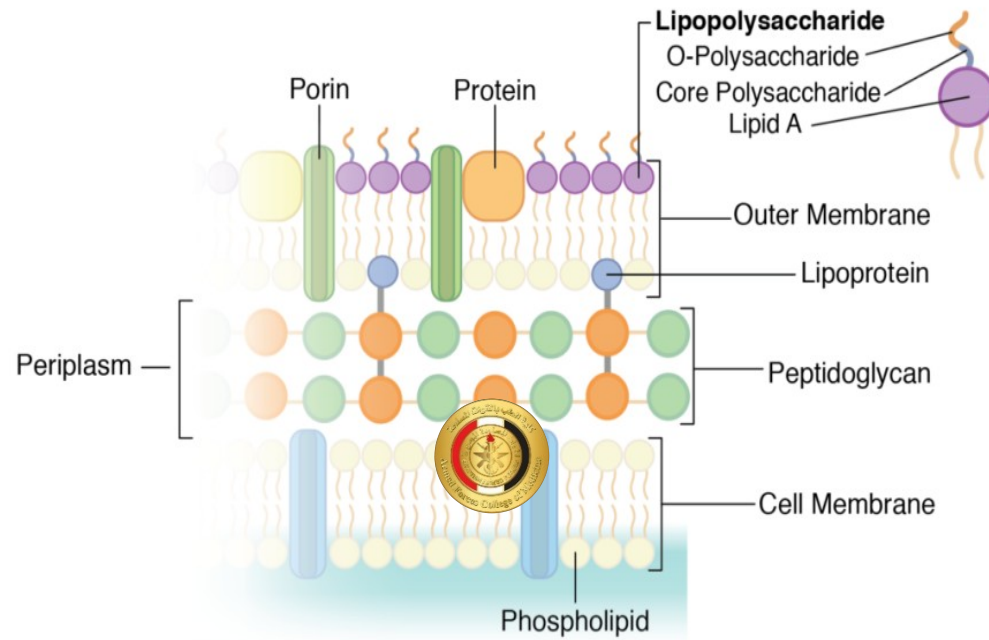


**What is the most probable causative organism of gastroenteritis?**



The most probable causative organism of this gastroenteritis is **Campylobacter jejuni** (**C. jejuni**).

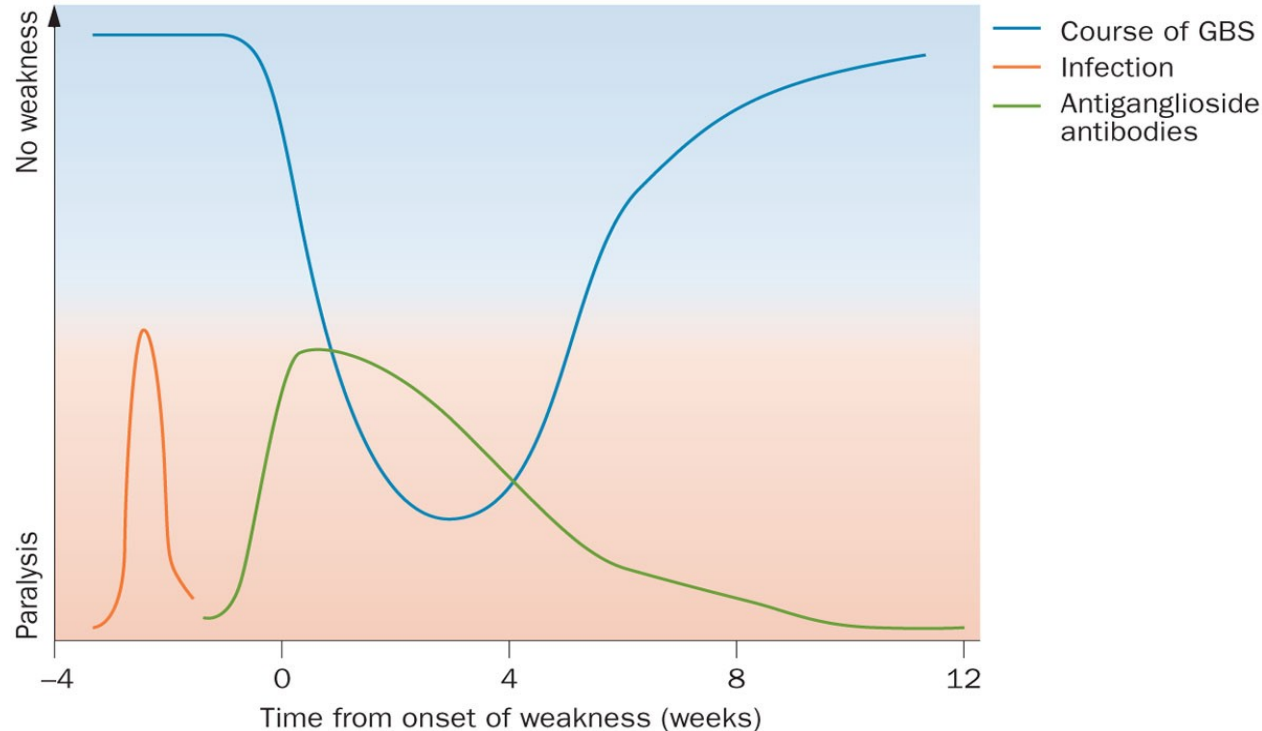
- Gram-negative rods .
- **Comma-** or **S** shaped.
- **Microaerophilic**, growing best in 5% oxygen rather than in the 20% present in the atmosphere.
- Optimum temp: **42°C**.



Gram Negative Bacteria Cell Wall



**What is the pathogenesis of GBS in relation to this organism?**



The majority of patients with GBS report an **infection before the onset of weakness**. Antiganglioside antibodies are often detected; their levels decrease over time. Progressive **weakness** reaches its maximum within 4 weeks. The **recovery** phase may last many weeks, months or even years.

**lets remember some terms**

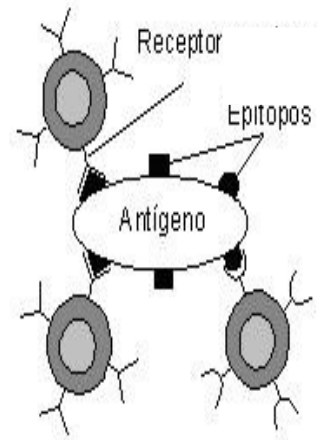
# Epitope (antigenic determinant)



## Size & Function

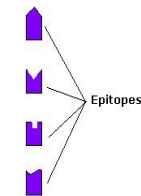
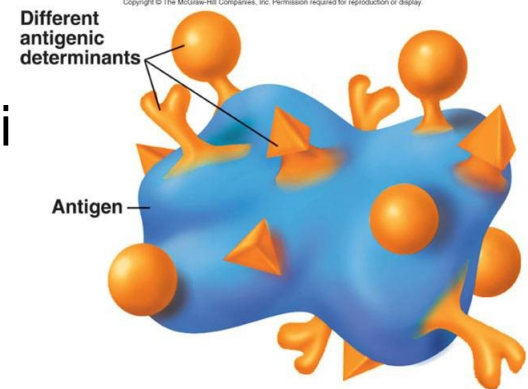
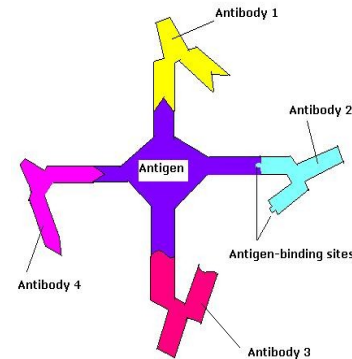
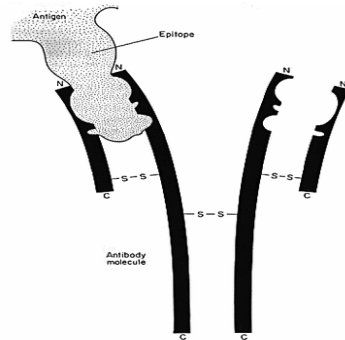
Is the **smallest biochemical unit** of Ag that bi

with **Ag R** on B & T cells



| R

**Paratope** of secreted Ab





## I-Characters

### A- Derived from different spe

Organisms, mammals

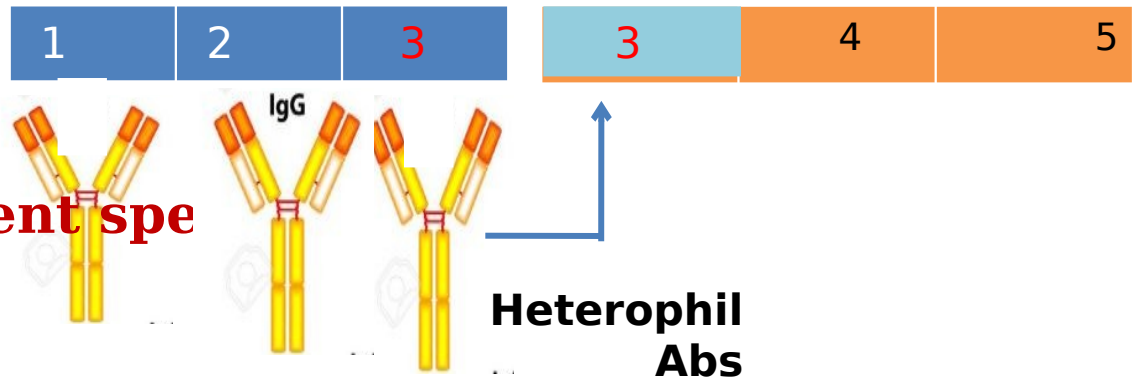


### B-Share one or more epitopes



Induce production of **heterophil Abs**

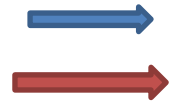
Cross react with shared epitopes



## II-Practical Applications

### Pathogenesis of some autoimmune diseases

Some *C. jejuni* lipo-oligosaccharides



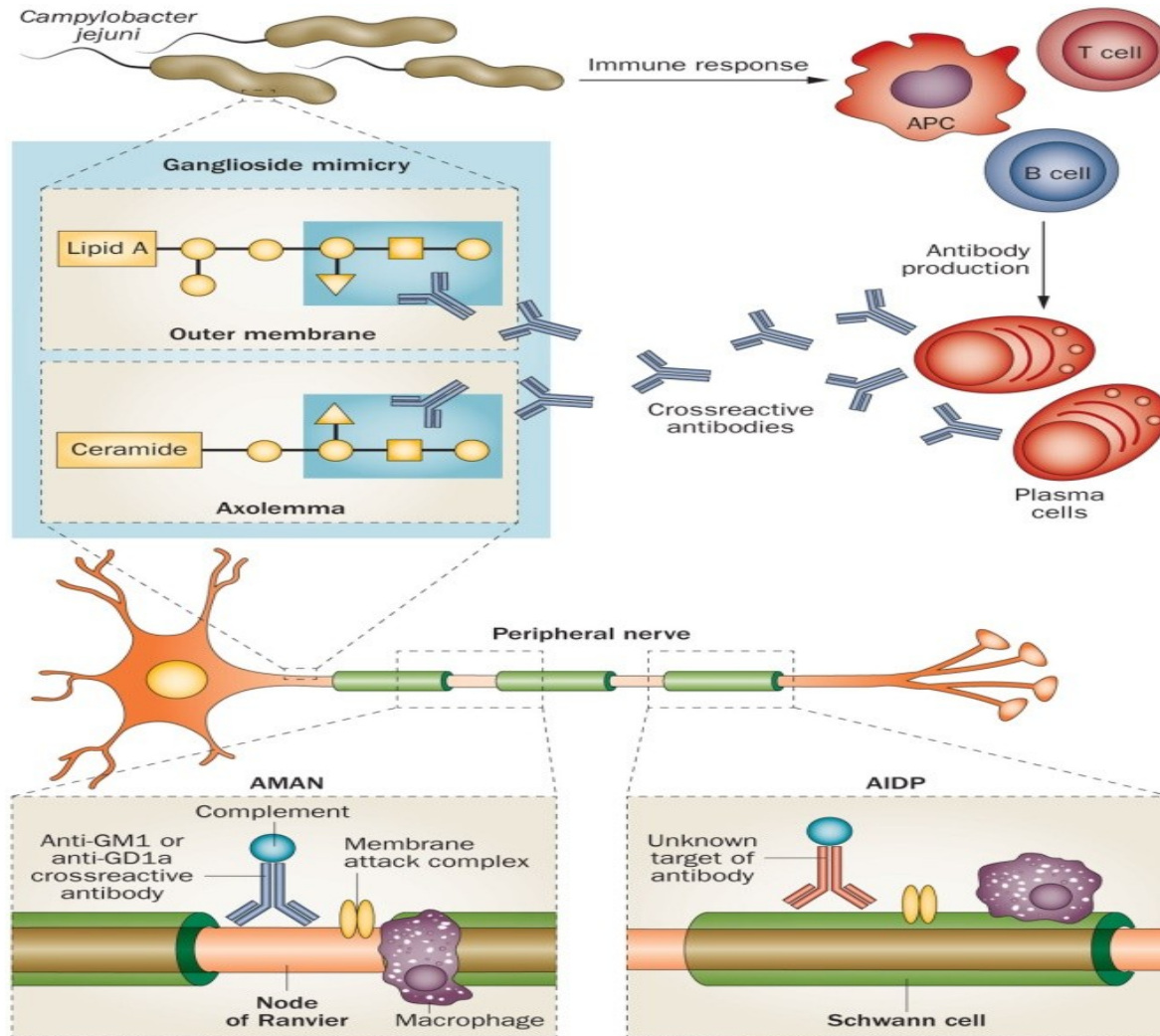
activate **dendritic cells** via Toll-like  
receptor 4 & CD14

type 1 interferon & tumour necrosis factor  
(TNF)

(+) of B cells.

**antibodies**

# Immunopathogenesis

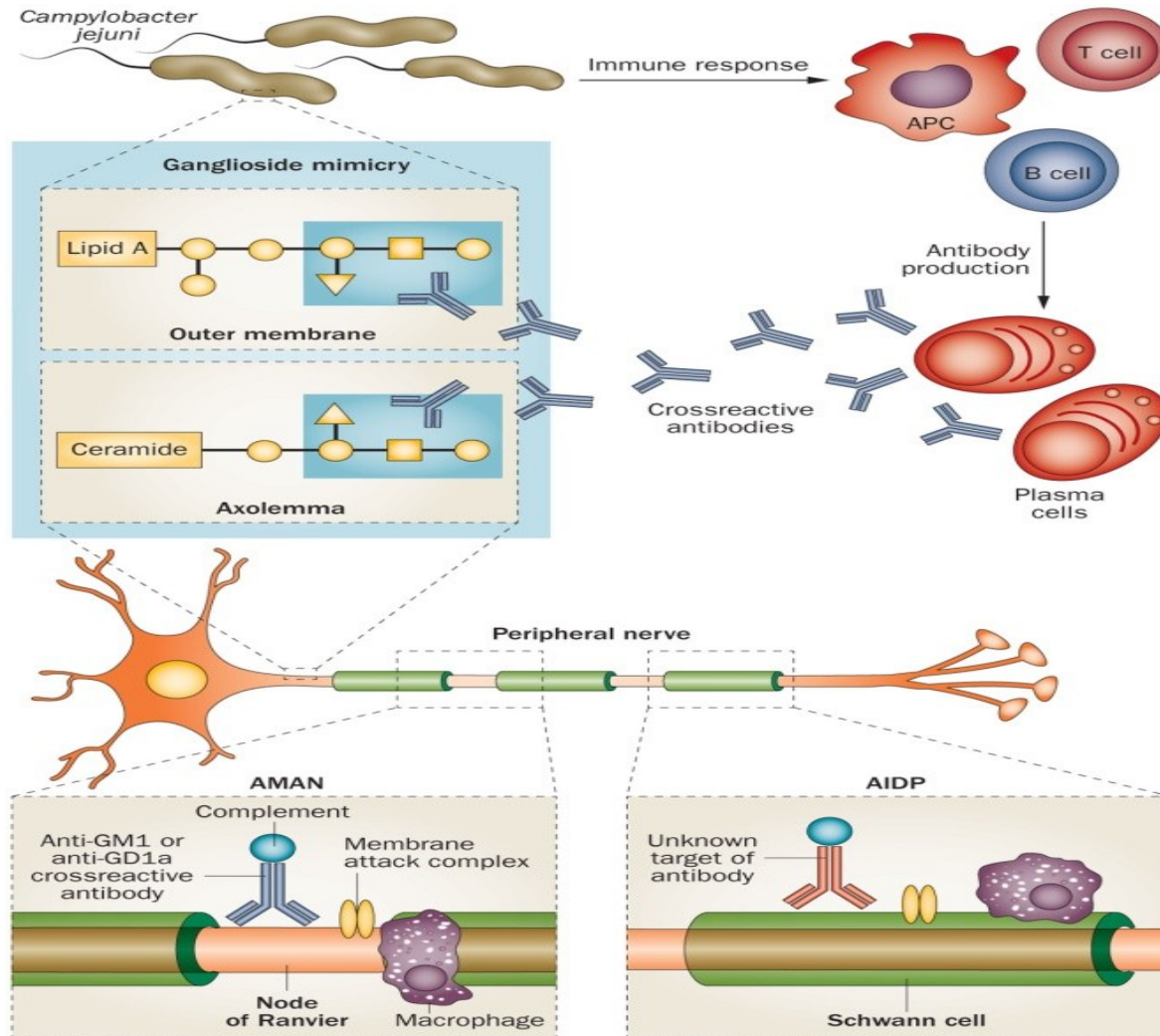


## Immunopathogenesis of GBS

## Molecular mimicry:

Infections with *C. jejuni* → production of antibodies → (anti-GM1 and anti-GD1a antibodies) → **crossreact** with gangliosides (GM1 and GD1a on peripheral nerves) → Complement activation → detachment of paranodal myelin and nerve conduction failure. Macrophages then invade from the nodes scavenging the injured axons vesicular degeneration.

# Immunopathogenesis



## Immunopathogenesis of GBS



**What is the possible relation between respiratory tract infection & GBS?**



**GBS can occur after infection with other pathogens that can cause respiratory tract infections as:**

- **Cytomegalovirus.**
- **Epstein- Barr virus.**
- **Mycoplasma pneumonia.**
- **Haemophilus influenzae.**
- **Influenza A virus.**
- Some researches reported that GBS can occur post **COVID 19** infection.